

REMARKS

Claims 1-24 are pending. Claims 18-22 have been withdrawn from consideration as being directed to non-elected inventions. Claim 24 has been added. Reconsideration in view of the following remarks is respectfully requested.

Entry of this amendment is proper under 37 C.F.R. § 1.116 as the amendments: (a) place the application in condition for allowance for the reasons discussed herein; (b) do not raise any new issues that would require further consideration and/or search as the amendments merely amplify issues discussed throughout the prosecution; and (c) place the application in better form for appeal, should an appeal be necessary. The amendments are necessary and were not earlier presented as they are in response to arguments raised in the final rejection. Entry of the Amendment is respectfully requested.

Claim Rejection – 35 USC § 102

The Examiner rejected claims 1-4, 17 and 23 under 35 U.S.C. § 102(e) as being anticipated by Cole et al. (U.S. Patent No. 6,387,596).

Claim 1 recites, *inter-alia*, “wherein at least one of said first and second exposures is performed using an illumination mode having a substantially dipolar intensity distribution, and wherein at least one of said patterns which is imaged using the illumination mode having a substantially dipolar intensity distribution comprises features oriented substantially perpendicular to an axis joining respective two poles of the substantially dipolar intensity distribution.” This enables, among other things, lithography to be performed with reduced feature size and/or improved processing parameters such as, for example, exposure latitude, mask error factor, depth of focus and proximity effects, without having to use improved optics and/or diffraction-assisted masks.

Cole et al. merely discloses a method of forming resist images in a photosensitive resist comprising exposing the photosensitive resist to a first mask having a grid pattern to form a latent nested image of the grid mask in the photosensitive resist and exposing the photosensitive resist containing the latent pattern image to a trim mask having a predetermined pattern.

Cole does not disclose, teach or suggest that a dipolar intensity distribution is used to image one of a first pattern and a second pattern and at least one of the patterns which is imaged using the illumination mode having a substantially dipolar intensity distribution

comprises features oriented substantially perpendicular to an axis joining respective two poles of the substantially dipolar intensity distribution.

Consequently, Cole et al. does not disclose, teach or suggest the subject matter recited in claim 1.

Therefore, Applicants respectfully submit that claim 1, and claims 2-4, 17 and 23 which depend directly or indirectly from claim 1, are patentable. Thus, Applicants respectfully request that the rejection of claims 1-4, 17 and 23 under § 102(e) be withdrawn.

Claim Rejection – 35 USC § 103

The Examiner rejected claims 1-3, 5-10, 14, and 17 under 35 U.S.C. § 103(a) as being unpatentable over Tanabe (US Patent No. 5,476,736) in view of Kim et al. (US Patent No. 5,821,034).

The Examiner admits that Tanabe does not disclose that at least one of the first and second exposures are in dipolar illumination mode. In response to Applicants arguments filed on January 16, 2004, the Examiner contends that Tanabe discloses performing a first exposure to form a first defocused optical image (first pattern) on a resist film, and performing a second exposure to form a second defocused optical image on the resist film (second pattern). The Examiner, thus, characterizes the first defocused image as being a first pattern and characterizes the second defocused image as being a second pattern. Applicants respectfully disagree.

Applicants respectfully submit that Tanabe merely discloses carrying out first and second projections of a beam of light onto a photoresist film through a same mask, i.e., a same pattern, at two different positions of the photoresist along the optical axis of the projection system. Tanabe forms a first defocused image on the photoresist when carrying out the first projection and forms a second defocused image on the photoresist when carrying out the second projection. The first defocused image formed by the first projection in Tanabe is completely different from and cannot be equivalent to the first pattern recited in claim 1. Similarly, the second defocused image formed by the second projection in Tanabe is completely different from and cannot be equivalent to the second pattern recited in claim 1. Claim 1 specifically recites performing a first exposure to image a first pattern and performing a second exposure to image a second pattern. Whereas, in Tanabe the first and second defocused images, characterized by the Examiner as being “the first and second patterns,” are formed on a photoresist and are not imaged. Consequently, Tanabe does not

disclose, teach or remotely suggest performing a first exposure to image a first pattern and performing a second exposure to image a second pattern.

Moreover, Tanabe does not disclose, teach or suggest “at least one of said patterns which is imaged using the illumination mode having a substantially dipolar intensity distribution comprises features oriented substantially perpendicular to an axis joining respective two poles of the substantially dipolar intensity distribution,” as recited in claim 1.

Kim et al. simply projects a micro-pattern using a dipole illumination oriented in a first direction (X-axis) and projects the same micro-pattern using a dipole illumination oriented in a second direction (Y-axis). In fact, Kim et al. states that projecting a micro-pattern using a dipole illumination in X-axis and then projecting the micro-pattern using a dipole illumination in Y-axis allows obtaining the same effect as in the case of two sheets of masks (see col. 4, lines 20-30 in Kim et al.). Thus, according to Kim et al., only one mask, i.e., one pattern, is required resulting in a reduction of mask-manufacturing costs.

Furthermore, there is no suggestion in Tanabe to modify the ring-shaped illumination of Tanabe (Figure 5A of Tanabe) or the quadrupolar quarter-circle-shaped illumination of Tanabe to employ the dipole illumination system of Kim et al. Moreover, even if Tanabe uses the dipolar illumination of Kim et al. which Applicants do not concede, Tanabe et al. would simply carry out first and second projections of the beam of light having “a dipolar configuration” onto a photoresist film through a same mask, i.e., a same pattern, at two different positions of the photoresist (first and second defocused positions) along the optical axis of the projection system. For the reasons provided above, Tanabe first and second defocused positions cannot be considered as being, respectively, first and second patterns. Thus, Tanabe would not be performing a first exposure to image a first pattern and performing a second exposure to image a second pattern.

Furthermore, neither Tanabe nor Kim et al., alone or in combination, disclose, teach or suggest that at least one of the patterns which is imaged using the illumination mode having a substantially dipolar intensity distribution comprises features oriented substantially perpendicular to an axis joining respective two poles of the substantially dipolar intensity distribution.

Therefore, for at least the above reasons, Applicants respectfully submit that claim 1 and claims 2, 3, 5-10, 14 and 17 which depend directly or indirectly from claim 1, are patentable. Thus, Applicants respectfully request that the rejection of claims 1-3, 5-10, 14 and 17 under § 103(a) be withdrawn.

The Examiner rejected claims 4 and 23 under 35 U.S.C. § 103(a) as being unpatentable over Tanabe (US Patent No. 5,476,736) in view of Kim et al. (US Patent No. 5,821,034) and further in view of Neisser (US patent No. 5,563,012).

Claims 4 and 23 depend indirectly from claim 1. Therefore, for at least the reasons presented above in claim 1, Tanabe and Kim et al. do not disclose, teach or suggest, alone or in combination, the subject matter recited in claims 4 and 23. Neisser fails to overcome the deficiencies noted above in Tanabe and Kim et al. Specifically, Neisser fails to disclose, teach or suggest anything about a substantially dipolar illumination and fails to disclose, teach or suggest performing a first exposure to image a first pattern and performing a second exposure to image a second pattern. Consequently, Tanabe, Kim et al. and Neisser do not disclose, teach or suggest, alone or in combination, the subject matter recited in claims 4 and 23.

Therefore, Applicants respectfully submit that claims 4 and 23 are patentable and respectfully request that the rejection of claims 4 and 23 under § 103(a) be withdrawn.

The Examiner rejected claims 11-13 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanabe in view of Kim et al. and further in view of Nishi (US Patent Application Publication No. 2002/0109827 A1).

Claims 11-13 depend directly or indirectly from claim 1. Therefore, for at least the reasons presented above in claim 1, Tanabe and Kim et al. do not disclose, teach or suggest the subject matter recited in claims 11-13. Furthermore, as conceded by the Examiner, Tanabe and Kim et al. do not disclose, teach or suggest at least one of the exposures is performed using polarized electromagnetic radiation. Moreover, Nishi fails to overcome the deficiencies noted above in Tanabe and Kim et al. Specifically, contrary to the Examiner's contention, Nishi fails to disclose, teach or suggest anything about a substantially dipolar illumination or dipolar intensity distribution. Consequently, Tanabe, Kim et al. and Nishi, do not disclose, teach or suggest, alone or in combination, the subject matter recited in claims 11-13.

Therefore, Applicants respectfully submit that claims 11-13 are patentable and respectfully request that the rejection of claims 11-13 under § 103(a) be withdrawn.

The Examiner rejected claims 15-16 are rejected under 35 U.S.C. § 103(a) as being unpatentable over Tanabe in view of Kim et al. and further in view of Maeda et al. (US Patent No. 6,263,099). Applicants respectfully traverse this rejection for at least the following reason.

Claims 15 and 16 are directly or indirectly dependent from claim 1. Therefore, for at least the reasons presented above in claim 1, Tanabe and Kim et al. do not disclose, teach or suggest the subject matter recited in claims 15 and 16. Moreover, Maeda et al. fails to overcome the deficiencies noted above in Tanabe and Kim et al. Consequently, Tanabe, Kim et al. and Maeda et al. do not disclose, teach or suggest, alone or in combination, the subject matter recited in claims 15 and 16.

Therefore, Applicants respectfully submit that claims 15 and 16 are patentable and respectfully request that the rejection of claims 15 and 16 under § 103(a) be withdrawn.

New claim 24 has been added. Support for the claim language may be found throughout the initial disclosure. Claim 24 recites, *inter-alia*, “the pattern imaged using the illumination mode having the substantially dipolar intensity distribution comprises features oriented substantially perpendicular to an axis joining respective two poles of the substantially dipolar intensity distribution.” None of the relied upon references Cole et al., Tanabe, Kim et al., Neisser, Nishi and Maeda et al., alone or in combination, disclose, teach or suggest the subject matter recited in claim 24. Therefore, Applicants respectfully submit that claim 24 is patentable.

CONCLUSION

In view of the foregoing, the claims are now in form for allowance, and such action is hereby solicited. If any point remains in issue which the Examiner feels may be best resolved through a personal or telephone interview, he is kindly requested to contact the undersigned at the telephone number listed below.

All objections and rejections having been addressed, it is respectfully submitted that the present application is in a condition for allowance and a Notice to that effect is earnestly solicited.

Respectfully submitted,

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